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Photo Series for Quantifyi Forest Residues in the:

Northern Hardwood Type
Oak-Hickory Type

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F. S.
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Abstract

A series of 14 photographs which display different forest residue loading levels for areas of like timber type, cutting practice or insect and disease mortality.

Information with each photo includes measured weights, volumes and other residue data, information about the timber stand and harvest, and fire behavior fuel model number.

These photo series provide a fast and easy-to-use means for quantifying and describing existing and expected residues.

Acknowledgment

Appreciation is extended to Wayne Maxwell, now retired, of the Pacific Northwest Forest and Range Experiment Station in Portland, Oregon, who spent a week in Pennsylvania in 1976 training personnel in the field techniques.

Appreciation is also extended to Robert McDonald, then Staff Director for Cooperative Forest Fire Control, Northeastern Area, State and Private Forestry, Forest Service, for arranging Wayne Maxwell's visit to Pennsylvania.

List of Tree Species Observed during Field Inventory

Sweet birch	*Betula lenta* L.
Yellow birch	*Betula alleghaniensis* Britton
American beech	*Fagus grandifolia* Ehrh
American basswood	*Tilia americana* L.
Yellow poplar	*Liriodendron tulipifera* L.
White ash	*Fraxinus americana* L.
Black locust	*Robinia pseudoacacia* L.
Black cherry	*Prunus serotina* Ehrh
Red maple	*Acer rubrum* L.
Sugar maple	*Acer saccharum* Marsh.
Black walnut	*Juglans nigra* L.
Aspen	*Populus*
Hickory	*Carya* Nutt.
Chestnut oak	*Quercus prinus* L.
Northern red oak	*Quercus rubra* L.
Scarlet oak	*Quercus coccinea* Muenchh.
White oak	*Quercus alba* L.
Eastern hemlock	*Tsuga canadenis* (L.) Carr.
Virginia pine	*Pinus virginiana* Mill.
Pitch pine	*Pinus rigida* Mill.
Eastern red cedar	*Juniperus virginiana* L.

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What is This Photo Series?

This photo series is an array of photos showing different residue loading levels found in natural timber stands of like types or generated from insect and disease mortality or from cutting practices. Each photo is supplemented with information which includes:

- Measured quantities by size classes, average depth, ground area covered and other residue data
- Harvesting or mortality information
- Fuel Model

Thus, the series provide a basis for quantifying and describing existing and expected residue loadings on other areas and serve as a communication link between users.

Purpose of Photo Series

Forest residue is the woody debris present on the forest floor. It is made up of stems, branches, twigs, and bark. This residue is caused by natural events, motality from insects or disease infestation, or from previous forestry operations. Together, the accumulated debris and slash can create a hazardous fuel situation that must be dealt with by the land manager. The most important reason for evaluating the forest

residue is to determine if the debris and slash presents an acceptable or unacceptable fire hazard to the selected crop trees or to the surrounding forest area. If the hazard is judged unacceptable, the land manager can make some decisions concerning fire prevention and suppression or the amount and type of treatment needed to abate the hazard.

The photo series can also be of value to the land manager from the standpoint of utilization. Much of the residues remaining in the forest following harvest operations can be utilized for fuel wood. By using the photos, the land manager can determine which areas can be utilized for fuel wood. Since some residues are beneficial for such purposes an nutrient cycling, soil protection, wildlife cover, and micro-climate effect, the land manager can also decide how much residue should be removed to reduce the residue to a level considered desirable. To reduce residues to a level considered desirable, estimates are needed on quantities that now exist or will be created by some activity.

Inventory techniques, such as the planar intersect method, are very useful when a high degree of accuracy is needed. However, these techniques are time consuming and costly to apply extensively. Photo series can be used to make fast, easy, and inexpensive quantifications of residue adequate for most management needs.

In the past there had been no way for all resource disciplines to become readily familiar with residue volumes and descriptions so that they could make accurate decisions relating to residue management, fire prevention planning, or expected fire behavior. These deficiencies can be overcome with the photo series.

How Can They be Used?

Inventory of Down Residue

Fuel loadings in various residue size classes, average residue depth, and ground area covered are characteristics that are visible in the photographs: hence, users can estimate any of these characteristics on an area being inventoried by comparing them with the photos as follows:

1. Observe each characteristic of the residue on the ground (e.g., 3.1 — to 9-inch loading).

2. Select a photo which nearly matches, or photos that bracket the observed characteristic.

3. Obtain the quantitative value for the characteristic being estimated from the data sheet accompanying the selected photo (or interpolate a value between photos).

These steps are repeated for each characteristic desired. If the general area being inventoried has zones of obvious differences in residue loading, the user should consider making separate determinations for each zone which can then be weighted and cumulated for the whole area.

Residue characteristics not distinguishable by use of the photographs are duff and litter depth, proportion of sound residue by species, and proportion rotted. If values for these characteristics are desired in an inventory, they must be derived from independent sampling or observations.

Inventory information can be used by land managers to (1) evaluate impact residues have on various aspects of forest management, (2) identify areas of unacceptable residue loading, (3) identify priority areas for treatment, (4) estimate amount of utilizable material, and (5) estimate fire behavior characteristics.

Determination of Desired Residue Level

Land management objectives can be more nearly achieved if a team of appropriate specialists can participate in specifying residues which should remain on site after completion of a cutting activity. Individuals helping with these determinations can

study the photo series to recognize the appearance of various quantities and distributions of residue. With this knowledge, each individual can describe in quantitative terms the residue they believe should be retained to meet environmental concerns and goals of their particular specialty. The group can then use the photo series as a communicative tool to resolve differences in arriving at a desired level.

After treatment, the degree to which objectives were achieved can be judged by comparing observed post-treatment loading with the desired level description.

Prediction of Residues from Planned Cutting or from Insect and Disease Infestation

Photo series are a rudimentary aid for predicting amounts of residue from cutting and insect and disease infestation. Many factors, such as condition of timber stand, topography, logging method, utilization intensity or intensity of insect and disease infestation, affect the volume of resulting residues; so users should bear in mind that these series depict only a few of the possible combinations.

To predict residue volumes from planned cutting, the user compares timber volume and size information from cutting plans with this kind of information in the photo series. Selecting a photo series level or levels with similar stand characteristics, the user refers to data sheet loadings, considers factors which differ from the photo series situations, and quantifies the loading expected.

Predicted loadings can be used to support changes in cutting and removal actions.

National Fire Behavior Fuel Models

For each level presented, one of the 13 national fire behavior fuel models has been indicated. However, there are only six different fire behavior fuel models represented by this series; those of the timber and logging slash groups. The type and volume of the fuel residue, as well as the litter present on the site, possess all the fuel descriptors required by the fire behavior model. It should be remembered that the fire behavior fuel model is used in predicting fire behavior in surface wildfires.

The land manager can use the photo series by comparing the known fuel model represented in the pictures to areas on the ground for which the fire behavior fuel model is not known. This can be a very useful tool to the land manager unfamiliar with fire behavior fuel models or to anyone who must make a quick determination of the fire behavior fuel model on a given site.

Use of this photo series can also assist the land manager in fuel mapping and the determination of expected fire behavior on a given site.

Fire Behavior Fuel Model Key

The following is a key to the six fire behavior fuel models represented in this series:

1. Timber Group

   A. Surface fuels are mostly foliage litter. Large fuels are scattered and lie on the

needles, i.e., are not supported above it by branches. Green fuels are scattered enough to be insignificant to fire spread.

1. Dead foliage litter is short needle, 2'' or less coniferous or small hardwood leaves tightly compacted ..... Fuel Model 8

2. Dead foliage litter is long needle pine or hardwood leaves loosely compacted ..... Fuel Model 9

B. There is a significant amount of larger fuels, many with attached branches and twigs, or the larger fuels have rotted enough that they are splintered and broken. The larger fuels are fairly well distributed over the area. Some green fuels may be present. The over-all depth of the fuel is probably below the knees ..... Fuel Model 10

II. Logging Slash Group

A. Slash is not continuous; other surface fuels, needle litter, or small amount of grass must be present to help carry the fire. Green fuels are absent or do not play a significant role in fire behavior. Over-all slash depth is about 1 foot ..... Fuel Model 11

B. Slash generally covers the ground, though there may be some bare spots or areas of light coverage. Average slash depth is about 2 feet. Slash is not excessively compacted. Approximately one-half of the needles may still be on the branches. Green fuels are absent or are not expected to affect fire behavior ..... Fuel Model 12

C. Same as B except needles that are still attached are red. Slash is continuous or nearly so. Slash is not excessively compacted. Approximately one-half of the needles are still on the branches. Green fuels are absent or are not expected to affect fire behavior ..... Fuel Model 13

Fuel Model Descriptions and Expected Fire Behavior[1]

The following are further descriptions and some expected fire behavior for the six fire behavior fuel models represented by this photo series.

Timber Group

Fire Behavior Fuel Model 8. Slow burning ground fires with low flame heights are generally the case, although the fire may encounter an occasional "jackpot" or heavy fuel concentration that can flare up. Only under severe weather conditions involving high temperatures, low humidities, and high winds do the fuels pose fire hazards. Closed canopy stands of short needle conifers or hardwoods that have leafed out

[1]From "Aids to selecting Fuel Models for Estimating Fire Behavior" by Hal. E. Anderson

support fire in the compact litter layer. This layer is mainly needles, leaves, and some twigs since little undergrowth is present in the stand.

Fire Behavior Model 9. Fires run through the surface litter faster than Model 8 and have higher flame height. Both long-needle conifer and hardwood stands especially the oak-hickory types, are typical. Fall fires in hardwoods are representative, but high winds will actually cause higher rates of spread than predicted. This is due to spotting caused by rolling and blowing leaves. Concentrations of dead-down woody material will contribute to possible torching out of trees, spotting, and crowning activity.

Fire Behavior Fuel Model 10. The fires burn in the surface and ground fuels with greater fire intensity than the other timber litter models. Dead-down fuels include greater quantities of 3-inch or larger limb wood resulting from overmaturity or natural events that create a large load of dead material on the forest floor. Crowning out, spotting and torching of individual trees is more frequent in this fuel situation leading to potential fire control difficulties. Any forest type may be considered if heavy down materials are present; examples are insect or disease-ridden stands, wind-thrown stands, over-mature situations with deadfall, and aged light thinning or partial-cut slash.

Logging Slash Group

Fire Behavior Fuel Model 11. Fires are fairly active in the slash and herbaceous material intermized with the slash. The spacing of the rather light fuel load, shading from overstory, or the aging of the fine fuels can contribute to limiting the fire potential. Light partial cuts or thinning operations in mixed conifer stands, hardwood stands and southern pine harvests are considered. Clearcut operations generally produce more slash than represented here. The less than 3-inch material load is less than 12 tons per acre.

Fire Behavior Fuel Model 12. Rapidly spreading fires with high intensities capable of generating fire brands can occur. When fire starts, it is generally sustained until a fuel break or change in fuels is encountered. The visual impression is dominated by slash and much of it is less than 3-inches in diameter. These fuels total less than 35 tons per acre and give the impression of well distributed fuels. Heavily thinned conifer stands, clearcuts and medium or heavy partial cuts are represented.

Fire Behavior Fuel Model 13. Fire is generally carried across the area by a continuous layer of slash. Large quantities of greater than 3-inch material are present. Fires spread quickly through the fine fuels and intensity builds up more slowly as the large fuels start burning. Active flaming is sustained for long periods and a wide variety of fire brands can be generated. These contribute to spotting problems as the weather conditions become more severe. Clearcuts and heavy partial-cuts in mature and overmature stands are depicted where the slash load is dominated by the greater than 3-inch material.

How Were They Developed?

Areas photographed for this series were selected to show typical residue loading variations in the two major vegetative types of Pennsylvania, oak-hickory and northern hardwoods. Photos were taken and data collected as follows:

1. Areas were photographed and the material in the photo area sampled in accordance with USDA Forest Service national guidelines.[2]

2. Measurement technique was in accordance with the "Handbook for Inventorying Downed Woody Material.[3]

3. Timber stand, logging, and residue treatment information was obtained from timber sale or project records in field office.

How Are Levels in This Series Coded?

The data for each level are presented on the page facing the photo. Facing picture and data pages have the same code for the residue situation shown. The code shows:

a. Order of rank from lightest loading to heaviest loading shown in the series of photographs.

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[2]USDA, Forest Service, 1975. National fuel classification and inventory system, preliminary draft, 61 p., illus. Washington Office, Washington, DC.

[3]Brown, James K. 1974. Handbook for inventorying downed wood material. USDA, Forest Service, Gen. Tech., Rep. INT-16, 24 p., illus. Intermt. For. and Range Exp. Stn., Ogden, Utah.

b. Forest type: A = oak-hickory, B = northern hardwoods

c. Forest Site Class, where:

1. Dominant and co-dominant trees reach 3 or more 16' logs at maturity.

2. Dominant and co-dominant trees reach 2 to 2½ logs at maturity.

d. Forest Size Class, where:

1. Saw timber 14" d.b.h. and larger

2. Large pole timber 8" to 14" d.b.h.

3. Small pole timber 4" — 8" d.b.h.

e. History of Area, where:

N = Natural Stands, no cutting practices — includes those which have insect and disease mortality

CC = Clearcut

ST = Seed tree harvest

EXAMPLE: 1 B21 N is the first photo in the series, northern hardwoods, Site 2 (trees 2 to 2½ logs in height), trees 14" d.b.h. and larger, no thinning or harvest practices.

Publication Credits

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Field work for this project was performed in the Commonwealth of Pennsylvania by the following personnel of the Pennsylvania Department of Environmental Resources Bureau of Forestry:

Fred Wilcox, Project Leader, Forester
John McCarty, Forest Technician
Barry Bungard, Forest Technician

1-A21-N

Spectacle Gap #1 DATA SHEET Residue descriptive code 1 A21 N

LOADING

Size class (inches)	Weight (tons/acre)	Volume (ft^3/acre)
0.25-1.0	1.6	81.6
1.1-3.0	1.4	68.1
3.1-9.0	3.7	205.8
9.1-20.0		
20.1+		
Total	6.7	355.5

OTHER MEASUREMENTS

Average residue depth (feet) .9

Ground area covered by residue 1/4-inch diameter and larger (percent) 24

Average duff and litter depth (inches) 1.5

Sound residue 3.1-inch diameter and larger
Mixed Oaks (percent) 85
Red Maple (percent) 8
(percent)

Rotted residue 3.1-inch diameter and larger (percent) 7

HARVEST INFORMATION

Gross volume cruised (mbf/acre)
Net volume cruised (mbf/acre)
Average stems/acre cut
Average d.b.h. of stems cut (inches)
Stand age (years)
Cutting prescription
Yarding method
Slash treatment
Period since cut or treatment (months)

PRE-COMMERCIAL THINNING INFORMATION

Stems cut/acre
Stems remaining/acre
Basal area/acre before
Basal area/acre after
Average d.b.h. before (inches)
Average d.b.h. after (inches)
Thinning method
Slash treatment

FUEL MODEL

Fire Behavior Fuel Model 9

REMARKS

Rattlesnake DATA SHEET Residue descriptive code 2 A22 N

LOADING

Size class (inches)	Weight (tons/acre)	Volume (ft^3/acre)
0.25-1.0	1.1	56.0
1.1-3.0	4.3	218.7
3.1-9.0		
9.1-20.0	1.7	37.1
20.1+		
Total	7.1	311.8

OTHER MEASUREMENTS

Average residue depth (feet) 1.6

Ground area covered by residue 1/4-inch diameter and larger (percent) 41

Average duff and litter depth (inches) 1.5

Sound residue 3.1-inch diameter and larger
Mixed Oaks (percent) 90
Other (percent) 6
(percent)

Rotted residue 3.1-inch diameter and larger (percent) 4

HARVEST INFORMATION

Gross volume cruised (mbf/acre)
Net volume cruised (mbf/acre)
Average stems/acre cut
Average d.b.h. of stems cut (inches)
Stand age (years)
Cutting prescription
Yarding method
Slash treatment
Period since cut or treatment (months)

PRE-COMMERCIAL THINNING INFORMATION

Stems cut/acre
Stems remaining/acre
Basal area/acre before 160
Basal area/acre after
Average d.b.h. before (inches)
Average d.b.h. after (inches)
Thinning method
Slash treatment

FUEL MODEL

Fire Behavior Fuel Model 10

REMARKS

Mortality 75%

High Knob Road #1 DATA SHEET Residue descriptive code 3 B21 N

LOADING

Size class (inches)	Weight (tons/acre)	Volume (ft³/acre)
0.25-1.0	.4	20.3
1.1-3.0	.7	35.6
3.1-9.0	)	
9.1-20.0	) 6.2	328.8
20.1+	)	
Total	7.3	384.7

OTHER MEASUREMENTS

Average residue depth (feet) .25

Ground area covered by residue 1/4-inch diameter and larger (percent) 16

Average duff and litter depth (inches) 1.3

Sound residue 3.1-inch diameter and larger

Red Maple (percent) 35

Red Oak (percent) 20

Others (percent) 20

Rotted residue 3.1-inch diameter and larger (percent) 25

HARVEST INFORMATION

Gross volume cruised (mbf/acre) ____
Net volume cruised (mbf/acre) ____
Average stems/acre cut ____
Average d.b.h. of stems cut (inches) ____
Stand age (years) ____
Cutting prescription ____
Yarding method ____
Slash treatment ____
Period since cut or treatment (months) ____

PRE-COMMERCIAL THINNING INFORMATION

Stems cut/acre ____
Stems remaining/acre ____
Basal area/acre before 140
Basal area/acre after ____
Average d.b.h. before (inches) ____
Average d.b.h. after (inches) ____
Thinning method ____
Slash treatment ____

FUEL MODEL

Fire Behavior Fuel Model 8

REMARKS

Spectacle Gap #2 DATA SHEET Residue descriptive code 4 A22 N

LOADING

Size class (inches)	Weight (tons/acre)	Volume (ft^3/acre)
0.25-1.0	1.9	91.3
1.1-3.0	3.0	147.0
3.1-9.0	4.5	226.7
9.1-20.0		
20.1+		
Total	9.4	465.0

OTHER MEASUREMENTS

Average residue depth (feet) 1.0

Ground area covered by residue 1/4-inch diameter and larger (percent) 38

Average duff and litter depth (inches) 2.1

Sound residue 3.1-inch diameter and larger

Mixed Oaks (percent) 75

Red Maple (percent) 15

Others (percent) 9

Rotted residue 3.1-inch diameter and larger (percent) 1

HARVEST INFORMATION

Gross volume cruised (mbf/acre) _____
Net volume cruised (mbf/acre) _____
Average stems/acre cut _____
Average d.b.h. of stems cut (inches) _____
Stand age (years) _____
Cutting prescription _____
Yarding method _____
Slash treatment _____
Period since cut or treatment (months) _____

PRE-COMMERCIAL THINNING INFORMATION

Stems cut/acre _____
Stems remaining/acre _____
Basal area/acre before _____
Basal area/acre after _____
Average d.b.h. before (inches) _____
Average d.b.h. after (inches) _____
Thinning method _____
Slash treatment _____

FUEL MODEL

Fire Behavior Fuel Model 9

REMARKS

Bovier Run DATA SHEET Residue descriptive code 5 B12 N

LOADING

Size class (inches)	Weight (tons/acre)	Volume (ft^3/acre)
0.25-1.0	1.0	53.2
1.1-3.0	2.5	128.4
3.1-9.0	)	
9.1-20.0	) 5.9	396.5
20.1+	)	
Total	9.4	578.1

OTHER MEASUREMENTS

Average residue depth		(feet)	1.0
Ground area covered by residue 1/4-inch diameter and larger		(percent)	36.0
Average duff and litter depth		(inches)	1.2
Sound residue 3.1-inch diameter and larger	Beech	(percent)	70
	Black birch	(percent)	9
	Others	(percent)	5
Rotted residue 3.1-inch diameter and larger		(percent)	16

HARVEST INFORMATION

Gross volume cruised (mbf/acre) ____
Net volume cruised (mbf/acre) ____
Average stems/acre cut ____
Average d.b.h. of stems cut (inches) ____
Stand age (years) ____
Cutting prescription ____
Yarding method ____
Slash treatment ____
Period since cut or treatment (months) ____

PRE-COMMERCIAL THINNING INFORMATION

Stems cut/acre ____
Stems remaining/acre ____
Basal area/acre before 170
Basal area/acre after ____
Average d.b.h. before (inches) ____
Average d.b.h. after (inches) ____
Thinning method ____
Slash treatment ____

FUEL MODEL

Fire Behavior Fuel Model 8

REMARKS

6-A12-N

Piper Gate

DATA SHEET

Residue descriptive code 6 A12 N

LOADING

Size class (inches)	Weight (tons/acre)	Volume (ft³/acre)
0.25-1.0	1.7	84.5
1.1-3.0	4.8	243.6
3.1-9.0	5.2	290.7
9.1-20.0		
20.1+		
Total	11.7	618.8

OTHER MEASUREMENTS

Average residue depth		(feet)	1.6
Ground area covered by residue 1/4-inch diameter and larger		(percent)	40
Average duff and litter depth		(inches)	2.1
Sound residue 3.1-inch diameter and larger	mixed oaks	(percent)	70
	others	(percent)	20
		(percent)	
Rotted residue 3.1-inch diameter and larger		(percent)	10

HARVEST INFORMATION

Gross volume cruised (mbf/acre) ____
Net volume cruised (mbf/acre) ____
Average stems/acre cut ____
Average d.b.h. of stems cut (inches) ____
Stand age (years) ____
Cutting prescription ____
Yarding method ____
Slash treatment ____
Period since cut or treatment (months) ____

PRE-COMMERCIAL THINNING INFORMATION

Stems cut/acre ____
Stems remaining/acre ____
Basal area/acre before ____
Basal area/acre after ____
Average d.b.h. before (inches) ____
Average d.b.h. after (inches) ____
Thinning method ____
Slash treatment ____

FUEL MODEL

Fire Behavior Fuel Model 10

REMARKS

Mortality 60%

LOADING

Size class (inches)	Weight (tons/acre)	Volume (ft^3/acre)
0.25-1.0	.8	40.7
1.1-3.0	3.6	183.1
3.1-9.0	7.9	416.4
9.1-20.0		
20.1+		
Total	12.3	640.2

OTHER MEASUREMENTS

Average residue depth (feet) 1.0

Ground area covered by residue 1/4-inch diameter and larger (percent) 30

Average duff and litter depth (inches) 1.4

Sound residue 3.1-inch diameter and larger

Red Maple (percent) 60

Red Oak (percent) 14

Others (percent) 12

Rotted residue 3.1-inch diameter and larger (percent) 14

HARVEST INFORMATION

Gross volume cruised (mbf/acre) _____
Net volume cruised (mbf/acre) _____
Average stems/acre cut _____
Average d.b.h. of stems cut (inches) _____
Stand age (years) _____
Cutting prescription _____
Yarding method _____
Slash treatment _____
Period since cut or treatment (months) _____

PRE-COMMERCIAL THINNING INFORMATION

Stems cut/acre _____
Stems remaining/acre _____
Basal area/acre before 140
Basal area/acre after _____
Average d.b.h. before (inches) _____
Average d.b.h. after (inches) _____
Thinning method _____
Slash treatment _____

FUEL MODEL

Fire Behavior Fuel Model 8

REMARKS

McCord Drive DATA SHEET Residue descriptive code 8 A22 N

LOADING

Size class (inches)	Weight (tons/acre)	Volume (ft^3/acre)
0.25-1.0	1.1	55.1
1.1-3.0	5.1	255.4
3.1-9.0	)	
9.1-20.0	) 9.6	497.4
20.1+	)	
Total	15.8	807.9

OTHER MEASUREMENTS

Average residue depth (feet) 3.7

Ground area covered by residue 1/4-inch diameter and larger (percent) 49

Average duff and litter depth (inches) 1.7

Sound residue 3.1-inch diameter and larger
- Mixed Oaks (percent) 50
- Red Maple (percent) 27
- Others (percent) 19

Rotted residue 3.1-inch diameter and larger (percent) 4

HARVEST INFORMATION

Gross volume cruised (mbf/acre) ____
Net volume cruised (mbf/acre) ____
Average stems/acre cut ____
Average d.b.h. of stems cut (inches) ____
Stand age (years) ____
Cutting prescription ____
Yarding method ____
Slash treatment ____
Period since cut or treatment (months) ____

PRE-COMMERCIAL THINNING INFORMATION

Stems cut/acre ____
Stems remaining/acre ____
Basal area/acre before 180
Basal area/acre after ____
Average d.b.h. before (inches) ____
Average d.b.h. after (inches) ____
Thinning method ____
Slash treatment ____

FUEL MODEL

Fire Behavior Fuel Model 10

REMARKS

Mortality 70%

9-A11-N

East Licking Creek DATA SHEET Residue descriptive code 9 A11 N

LOADING

Size class (inches)	Weight (tons/acre)	Volume (ft^3/acre)
0.25-1.0	1.7	86.5
1.1-3.0	2.8	142.4
3.1-9.0	)	
9.1-20.0	) 12.1	619.0
20.1+	)	
Total	16.6	847.9

OTHER MEASUREMENTS

Average residue depth (feet) 0.5

Ground area covered by residue 1/4-inch diameter and larger (percent) 41

Average duff and litter depth (inches) 2.6

Sound residue 3.1-inch diameter and larger
- Mixed Oaks (percent) 80
- Red Maple (percent) 10
- Others (percent) 5

Rotted residue 3.1-inch diameter and larger (percent) 5

HARVEST INFORMATION

Gross volume cruised (mbf/acre) ____
Net volume cruised (mbf/acre) ____
Average stems/acre cut ____
Average d.b.h. of stems cut (inches) ____
Stand age (years) ____
Cutting prescription ____
Yarding method ____
Slash treatment ____
Period since cut or treatment (months) ____

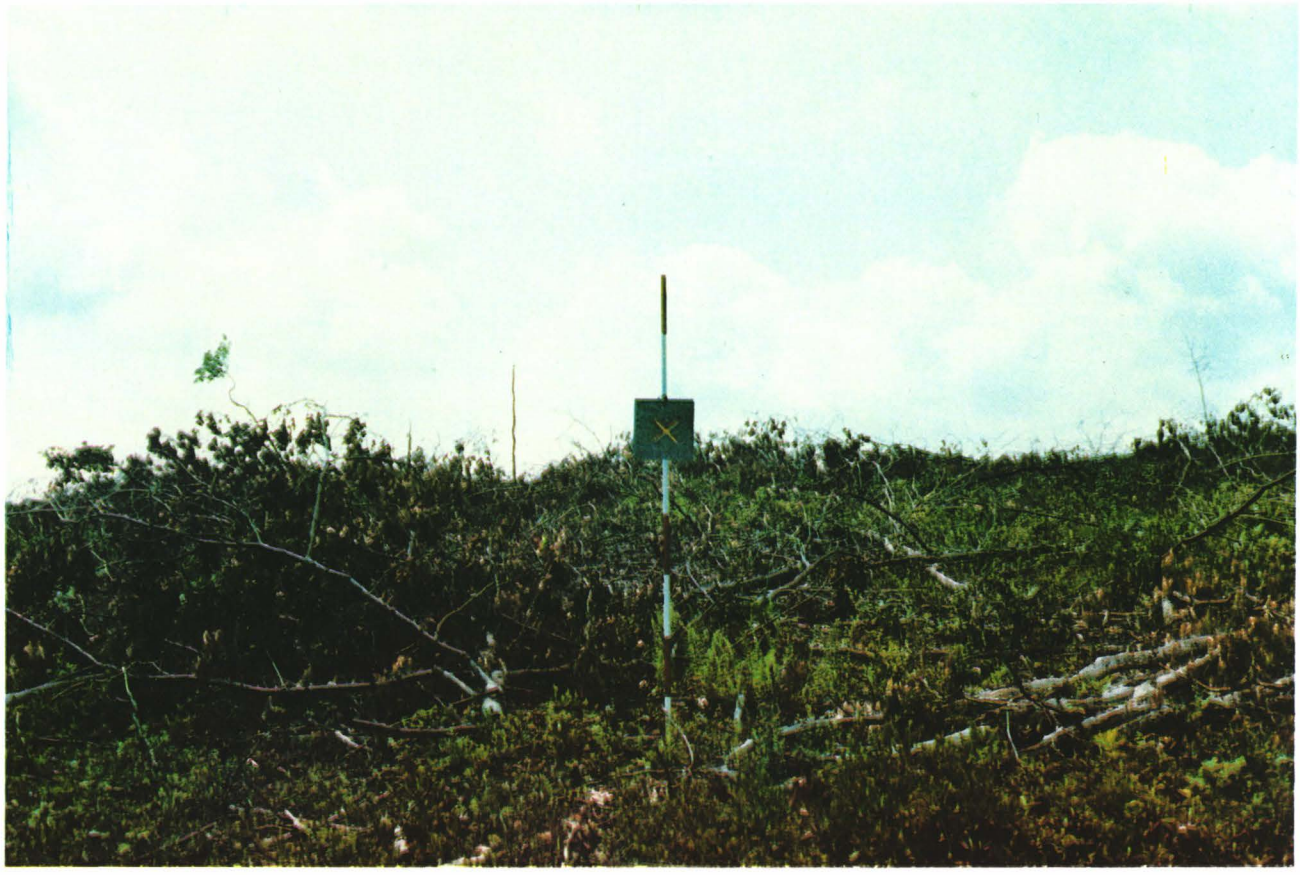
PRE-COMMERCIAL THINNING INFORMATION

Stems cut/acre ____
Stems remaining/acre ____
Basal area/acre before 130
Basal area/acre after ____
Average d.b.h. before (inches) ____
Average d.b.h. after (inches) ____
Thinning method ____
Slash treatment ____

FUEL MODEL

Fire Behavior Fuel Model 9

REMARKS



10-A22-CC

Bull Run DATA SHEET Residue descriptive code 10 A22 CC

LOADING

Size class (inches)	Weight (tons/acre)	Volume (ft³/acre)
0.25-1.0	2.2	118.0
1.1-3.0	7.5	401.2
3.1-9.0	11.7	614.8
9.1-20.0		
20.1+		
Total	21.4	1134.0

OTHER MEASUREMENTS

Average residue depth (feet) 1.1

Ground area covered by residue 1/4-inch diameter and larger (percent) 87

Average duff and litter depth (inches) 2.8

Sound residue 3.1-inch diameter and larger
- Mixed Oaks (percent) 71
- Pitch Pine (percent) 10
- Misc. (percent) 10

Rotted residue 3.1-inch diameter and larger (percent) 9

HARVEST INFORMATION

Gross volume cruised (mbf/acre) 2.4
Net volume cruised (mbf/acre) 2.1
Average stems/acre cut 320
Average d.b.h. of stems cut (inches) (saw timber) 14"
Stand age (years) 150
Cutting prescription clear cut
Yarding method rubber tired skidder
Slash treatment none
Period since cut or treatment (months) 6

PRE-COMMERCIAL THINNING INFORMATION

Stems cut/acre
Stems remaining/acre
Basal area/acre before 107
Basal area/acre after
Average d.b.h. before (inches)
Average d.b.h. after (inches)
Thinning method
Slash treatment

FUEL MODEL

Fire Behavior Fuel Model 11

REMARKS

Pulpwood data
Cruised 319 cu ft/acre
Average diameter 6.5"

11- B22-CC

Middle Branch Swamp
(South)

DATA SHEET

Residue descriptive code 11 322 CC

LOADING

Size class (inches)	Weight (tons/acre)	Volume (ft^3/acre)
0.25-1.0	4.5	233.2
1.1-3.0	.5	25.2
3.1-9.0	)	
9.1-20.0	) 27.0	1531.0
20.1+	)	
Total	32.0	1789.4

OTHER MEASUREMENTS

Average residue depth (feet) 3.0

Ground area covered by residue 1/4-inch diameter and larger (percent) 88

Average duff and litter depth (inches) 1.5

Sound residue 3.1-inch diameter and larger

Beech (percent) 71

Black birch (percent) 10

Others (percent) 12

Rotted residue 3.1-inch diameter and larger (percent) 7

HARVEST INFORMATION

Gross volume cruised (mbf/acre) 4.5
Net volume cruised (mbf/acre) 4.1
Average stems/acre cut
Average d.b.h. of stems cut (inches) 11
Stand age (years) 65
Cutting prescription clear cut
Yarding method rubber tired skidder
Slash treatment none
Period since cut or treatment (months) 6

PRE-COMMERCIAL THINNING INFORMATION

Stems cut/acre
Stems remaining/acre
Basal area/acre before 90
Basal area/acre after
Average d.b.h. before (inches)
Average d.b.h. after (inches)
Thinning method
Slash treatment

FUEL MODEL

Fire Behavior Fuel Model 12

REMARKS

Pulpwood Volume
840 cubic feet/ac.

12-A22-CC

Ramsey

DATA SHEET

Residue descriptive code 12 A22 CC

LOADING

Size class (inches)	Weight (tons/acre)	Volume (ft^3/acre)
0.25-1.0	1.8	90.1
1.1-3.0	8.8	440.7
3.1-9.0	30.1	1548.7
9.1-20.0		
20.1+		
Total	40.7	2079.5

OTHER MEASUREMENTS

Average residue depth		(feet)	2.5
Ground area covered by residue 1/4-inch diameter and larger		(percent)	81
Average duff and litter depth		(inches)	2.5
Sound residue 3.1-inch diameter and larger	Mixed Oaks	(percent)	80
	Pitch Pine	(percent)	5
	Misc.	(percent)	10
Rotted residue 3.1-inch diameter and larger		(percent)	5

HARVEST INFORMATION

Gross volume cruised (mbf/acre) 4.2
Net volume cruised (mbf/acre) 3.6
Average stems/acre cut 350
Average d.b.h. of stems cut (inches) (saw timber) 16"
Stand age (years) 160
Cutting prescription seed tree
Yarding method rubber tired skidder
Slash treatment none
Period since cut or treatment (months) 10

PRE-COMMERCIAL THINNING INFORMATION

Stems cut/acre
Stems remaining/acre
Basal area/acre before 90
Basal area/acre after
Average d.b.h. before (inches)
Average d.b.h. after (inches)
Thinning method
Slash treatment

FUEL MODEL

Fire Behavior Fuel Model 11

REMARKS

Pulpwood Data

Cruised 378.2 cu ft/acre

Average d.b.n. 7"

13-A22-CC

SALE 10-73-BC31

DATA SHEET

Residue descriptive code 13 A22 CC

LOADING

Size class (inches)	Weight (tons/acre)	Volume (ft^3/acre)
0.25-1.0	2.12	111.39
1.1-3.0	8.63	453.43
3.1-9.0	33.38	1756.44
9.1-20.0		
20.1+		
Total	44.13	2321.26

OTHER MEASUREMENTS

Average residue depth		(feet)	1.4
Ground area covered by residue 1/4-inch diameter and larger		(percent)	87
Average duff and litter depth		(inches)	3.9
Sound residue 3.1-inch diameter and larger	Mixed Oaks	(percent)	74
	Pitch Pine	(percent)	13
	Misc.	(percent)	10
Rotted residue 3.1-inch diameter and larger		(percent)	3

HARVEST INFORMATION

Gross volume cruised (mbf/acre)	1.21
Net volume cruised (mbf/acre)	1.04
Average stems/acre cut	320
Average d.b.h. of stems cut (inches) saw timber	14
Stand age (years)	95
Cutting prescription	clear cut
Yarding method	rubber tired skidder
Slash treatment	none
Period since cut or treatment (months)	8

PRE-COMMERCIAL THINNING INFORMATION

Stems cut/acre	
Stems remaining/acre	
Basal area/acre before	
Basal area/acre after	
Average d.b.h. before (inches)	
Average d.b.h. after (inches)	
Thinning method	
Slash treatment	

FUEL MODEL

Fire Behavior Fuel Model 12

REMARKS

Pulpwood Data

Cruised 520.37 cu ft/acre

Average d.b.n. 8"

14-B23-CC

Middle Branch Swamp
(North)

DATA SHEET

Residue descriptive code 14 B23 CC

LOADING

Size class (inches)	Weight (tons/acre)	Volume (ft^3/acre)
0.25-1.0	7.9	407.7
1.1-3.0	1.8	95.1
3.1-9.0	)	
9.1-20.0	) 52.6	2896.3
20.1+	)	
Total	62.3	3399.1

OTHER MEASUREMENTS

Average residue depth		(feet)	5.0
Ground area covered by residue 1/4-inch diameter and larger		(percent)	96
Average duff and litter depth		(inches)	2.6
Sound residue 3.1-inch diameter and larger	Beech	(percent)	80
	Black birch	(percent)	7
	Black cherry	(percent)	12
Rotted residue 3.1-inch diameter and larger		(percent)	1

HARVEST INFORMATION

Gross volume cruised (mbf/acre) 4.5
Net volume cruised (mbf/acre) 4.1
Average stems/acre cut
Average d.b.h. of stems cut (inches) 9
Stand age (years) 65
Cutting prescription clear cut
Yarding method rubber tired skidder
Slash treatment none
Period since cut or treatment (months) 6

PRE-COMMERCIAL THINNING INFORMATION

Stems cut/acre
Stems remaining/acre
Basal area/acre before 90
Basal area/acre after
Average d.b.h. before (inches)
Average d.b.h. after (inches)
Thinning method
Slash treatment

FUEL MODEL

Fire Behavior Fuel Model 13

REMARKS

Pulpwood volume
840 cubic feet/ac.